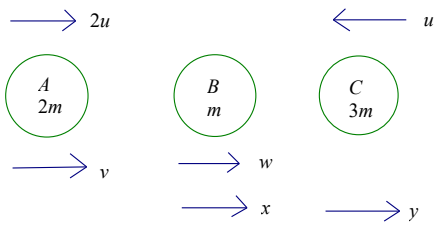
8a			
	Use CLM: $4mu = 2mv + mw$	M1	Need all terms. Condone sign errors. Dimensionally correct but allow with m cancelled
	$(4u = 2v + w)$	A1	Correct unsimplified. Signs correct for their v, w
	Use Impact law	M1	Used the right way round. Condone sign errors.
	$w - v = 2ue$	A1	Correct unsimplified. Signs consistent with CLM equation.
	$\Rightarrow 4u = 2(w - 2ue) + w$	DM1	Solve for v or w. Dependent on previous 2 M marks
	$3w = 4u + 4ue, \quad w = \frac{4}{3}u(1+e)$ *	A1*	Obtain **given result** from correct working
	$v = \frac{2}{3}u(2-e)$	A1	Or equivalent. Must be positive
		(7)	
8b	$2 > e$ so A moving towards centre	B1	Correct statement about direction of travel for A
	$mw - 3mu = mx + 3my$ $y - x = e\left(u + \frac{4u}{3} + \frac{4eu}{3}\right)$	M1	Use CLM and impact law correctly to form simultaneous equations in x and y.
	$\frac{4}{3}eu - \frac{5}{3}u = x + 3y$ $3y - 3x = e(7u + 4ue)$	A1	Both equations correct unsimplified in u, e, x and y
	$4x = \frac{4}{3}ue - \frac{5}{3}u - 7ue - 4ue^2$	DM1	Solve for x
	$x = -\frac{5}{12}u - \frac{17}{12}ue - ue^2$	A1	Allow for a correct constant multiple of x
	$e > 0, u > 0$ so B moving towards centre from opposite direction, hence they collide.*	A1*	Obtain **given answer** from correct working
		(6)	
	Alternative for last 3 marks;		
	C moving towards centre implies B moving towards centre, so collision. C moving away from centre , so $y > 0$, $x = w - 3u - 3y = -\frac{8u}{3} + \frac{4eu}{3} - 3y$	DM1	Consider direction of C

	$= -\frac{u}{3}(8-4e)-3y$	A1	
	< 0 because $e \leq 1$ and $y > 0$ hence B moving towards centre from opposite direction, and they will collide.*	A1*	Obtain **given answer** from correct working
		[13]	

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom